

# Deep Fake Image Detection Based on Pairwise Learning

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## Abstract

Generative adversarial networks (GANs) can be used to generate a photo-realistic image from a low-dimension random noise. Such a synthesized (fake) image with inappropriate content can be used on social media networks, which can cause severe problems. With the aim to successfully detect fake images, an effective and efficient image forgery detector is necessary. However, conventional image forgery detectors fail to recognize fake images generated by the GAN-based generator since these images are generated and manipulated from the source image. Therefore, in this paper, we propose a deep learning-based approach for detecting the fake images by using the contrastive loss. First, several state-of-the-art GANs are employed to generate the fake–real image pairs. Next, the reduced DenseNet is developed to a two-streamed network structure to allow pairwise information as the input. Then, the proposed common fake feature network is trained using the pairwise learning to distinguish the features between the fake and real images. Finally, a classification layer is concatenated to the proposed common fake feature network to detect whether the input image is fake or real. The experimental results demonstrated that the proposed method significantly outperformed other state-of-the-art fake image detectors.